PATENT SPECIFICATION

727,001

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COMPLETE SPECIFICATION

A Manually Operable Rotary Pump of the Flexible Tube Type

I, EVAN JOHN BAX, a British Subject, trading as E. & J. BAX ENGINEERING COMPANY, of Wheatley, in the County of Oxford, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to manually operable rotary pumps and concerns particularly a pump for the regular and periodic pumping of fluid such as is required in a blood transfusion pump in which predetermined volumes of blood are pumped into a patient at a rate corresponding with the heart-beat of the patient.

The object of the inventon is to provide a simply constructed and robust pump in which a single revolution thereof may effect one or a plurality of pumping operations and in which the pressure applied to the flexible tubing conveying the fluid may be varied at will very simply and very rapidly between predetermined limits.

A rotary pump of the flexible tube type has been proposed in which the tube is moulded to the shape of a segment of a torus so that it is mainly free of internal stress when not in use and in which the presser members (e.g. rollers) are mounted eccentrically on a spindle and are rotatable on said spindle so that they may be moved from their operative to their inoperative positions and *vice versa*.

According to the present invention, a fluid pump of this kind comprises a cylindrical pump body or a body having at least a part cylindrical surface, with which surface a flexible tube is adapted to engage, the flexible tube entering and leaving the body at spaced points around said surface, and a rotatable member mounted on a spindle formed with an eccentric boss to engage an aperture in the bottom of the pump body and supporting one, or around its periphery a plurality, of freely rotatable rollers adapted to bear on said flexible tube, the position of the spindle being adjusted over a wide range by an exterior control lever whereby the eccentricity of the rotatable member is varied with respect to the pump body as desired.

The rotatable member preferably carries a handle to enable it to be rotated by hand. The pump body may carry a bracket by which the pump is secured to any suitable support.

In the one position of the spindle of the rotatable member, which might be called the minimum position, the rotatable member is retained in such a position that its roller or rollers bear on the flexible tube with a minimum pressure and therefore the fluid is pumped gently, whereas in the other extreme position, which may be called the maximum position, the spindle is moved to such a position that the roller or rollers bear in turn on the flexible tube with a maximum pressure, thereby providing more forceful pumping.

In practice for a small pump, the rotatable member would carry four freely rotatable rollers whilst in a large pump, it may carry, for example, six or more such rollers equally spaced around its periphery.

The pump body and rotatable member may be constructed of metal, preferably an aluminium alloy, whilst the eccentrically mounted spindle may be of phosphor bronze. Each roller is preferably mounted on a ball race housed between the roller, also of aluminium alloy, and the spindle of, for example, phosphor bronze secured to the rotatable member. The main spindle supporting the rotatable member is secured in the pump body by screw means so as readily to be removable for cleaning and sterilisation

The invention is illustrated in the accompanying drawings of which Figure 1 is a section on the line 1—1 of Figure 2 which is a plan view and taken in the direction of the arrow *a* of Figure 3 which is a side elevation of the pump.

The pump consists of a cylindrical cup 11 having a base 12 in the centre of which is drilled a hole to receive a boss 13 formed eccentrically of a spindle 14 upstanding in the cup. To a square section 15 of the boss 13 is attached a lever 16 formed at its end, as at 19, to lie against the wall of the cup and

to be clamped thereagainst by the knurled screw 20. The spindle 14 and lever 16 are held in place by the knurled nut 17 engaging the screwed end 18 of the boss 13. A bracket 21 is welded or otherwise secured to the bottom 12 of the cup, one limb 22 of the bracket supporting a fixed clamp 23, whilst the other limb 24 supports an adjustable clamp 25, operable by the knurled screw 26. By this means, the pump may be attached securely in any convenient position.

Journalled on the spindle 14 is a sleeve 33 attached to a circular plate 32. Spaced peripherally around the plate 32 are four spindles 31 on which are journalled rollers 30, such spindles 31 being bolted to the plate 32 and enclosed by a cover plate 34 held in place by screw 35. The cover plate 34 supports a lever 36 formed with a knob 37. At approximately diametrically opposite sides of the cup, slits 40 and 41 are formed which terminate in openings 42 and 43 into which is squeezed a flexible pipe 50 to lie against the periphery (the right hand part) of the cup as seen clearly in Figure 2. Rotation of the plate 32 by means of the knob 37 brings the rollers 30 in sequence to bear against and squeeze the pipe 50.

With the lever 16 in the position shown in full lines in Figure 2, maximum eccentricity of the spindle 14, is ensured, with the plate 32 and hence the rollers 30 closest to the wall of the cup against which lies the pipe 50, thus maximum pressure on the pipe by the rollers is effected in this position. If now the lever 16 is rotated to the second position, e.g. through 110 shown in dot-and-dash lines in Figure 2, then the eccentricity of the spindle is lessened and the plate 32 takes up the position indicated in dot-and-dash lines, with the result that there is greater clearance between each of the rollers 30 and the wall of the cup against which the pipe 50 lies and consequently the rollers bear with less pressure on said pipe.

By adjusting the position of the plate 32 in this manner and by rotating it at greater or less speed, any pressure and period of pumping, within the limits of the pump, are very readily attained.

In order to remove the pipe from the pump, it is simply necessary to swing the lever from the position shown in full lines in Figure 2, through 180° when the rollers leave sufficient space for the pipe to be lifted clear.

Although a pump having four rollers has been described, it must clearly be understood that six, eight or more such rollers may be used if desired.

It will be clear that by means of the present invention for the purpose of effecting a blood transfusion the operator can check the heart beat of a patient, note whether the beat is weak or strong and actuate the pump to inject the blood at a rate and at pressure corresponding with the observed rate and strength of the patient's heart beat.

What I claim is:—

1. A manually operated rotary pump comprising a cylindrical pump body or body having at least a part cylindrical surface with which surface a flexible tube is adapted to engage, said flexible tube entering and leaving the body at spaced points around said surface, and a rotatable member mounted on a spindle formed with an eccentric boss to engage an aperture in the bottom of the pump body, said rotatable member supporting one, or around its periphery a plurality, of freely rotatable rollers adapted to bear on said flexible tube and said spindle being rotatable to vary over a wide range the eccentricity of the rotatable member with respect to the pump body.

2. A fluid pump as claimed in Claim 1, in which the eccentricity of the spindle is adjusted by an exterior control lever.

3. A rotary pump as claimed in Claim 1, in which the rotatable member carries a handle to enable it to be rotated by hand.

4. A rotary pump as claimed in any of the preceding Claims, in which a sleeve supporting the rotatable member engages the eccentric spindle and said rotatable member has secured in spatial relationship around its periphery two, four, six or more spindles on which are journalled freely rotatable rollers

5. A rotary pump as claimed in Claim 2, in which the exterior control lever is clamped to the pump body in any desired position.

6. A rotary pump as claimed in any of the preceding Claims, in which an adjustable clamp is secured to the pump body.

7. A manually operated rotary pump constructed arranged and adapted to be operated substantially as hereinbefore described and as illustrated in the accompanying drawings.

T. M. CONNELLY,
Chartered Patent Agent,
Agent for the Applicant.

PROVISIONAL SPECIFICATION

A Manually Operable Rotary Pump of the Flexible Tube Type

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This invention relates to manually operated

fluid pumps and con[illegible]particularly a pump for the regular and p[illegible]ic pumping of fluid such as is required in a blood transfusion pump in which predetermined volumes of blood are pumped into a patient at a rate corresponding with the heart-beat of the patient.

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Chartered Patent Agent,
Agent for the Applicant.

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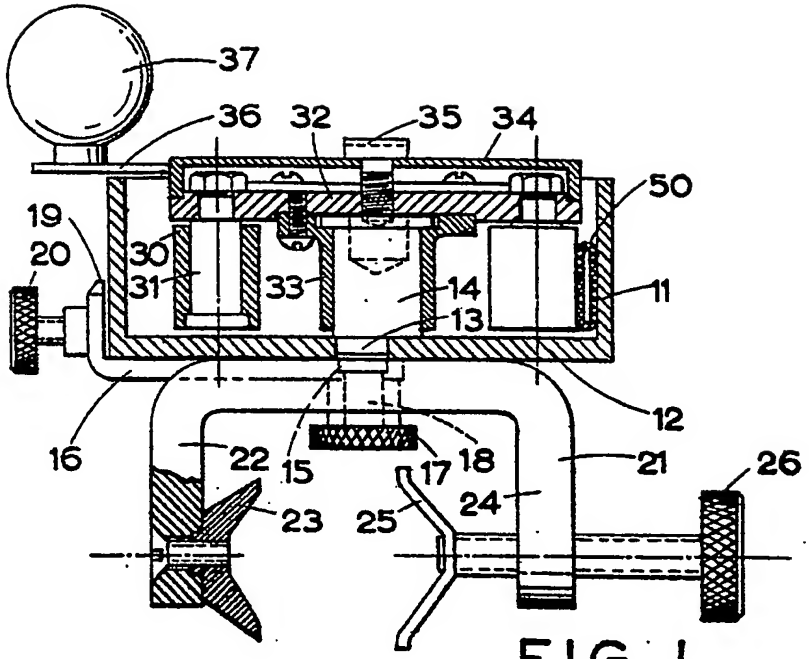
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FIG. 1

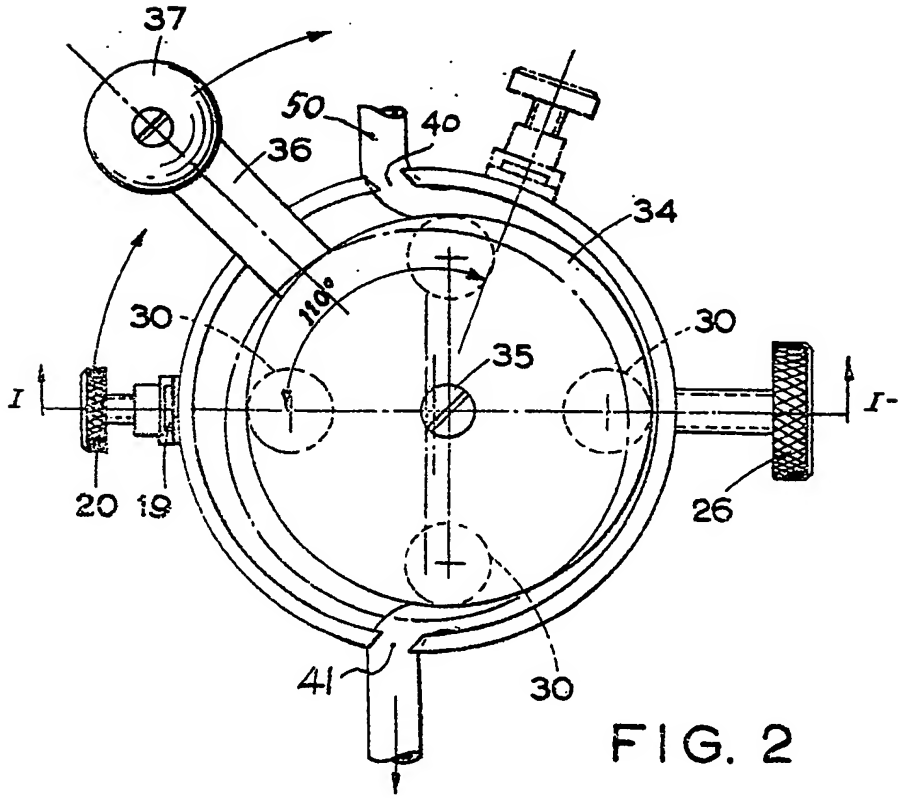
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FIG. 2

727,001 COMPLETE SPECIFICATION

2 SHEETS

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SHEETS 1 & 2

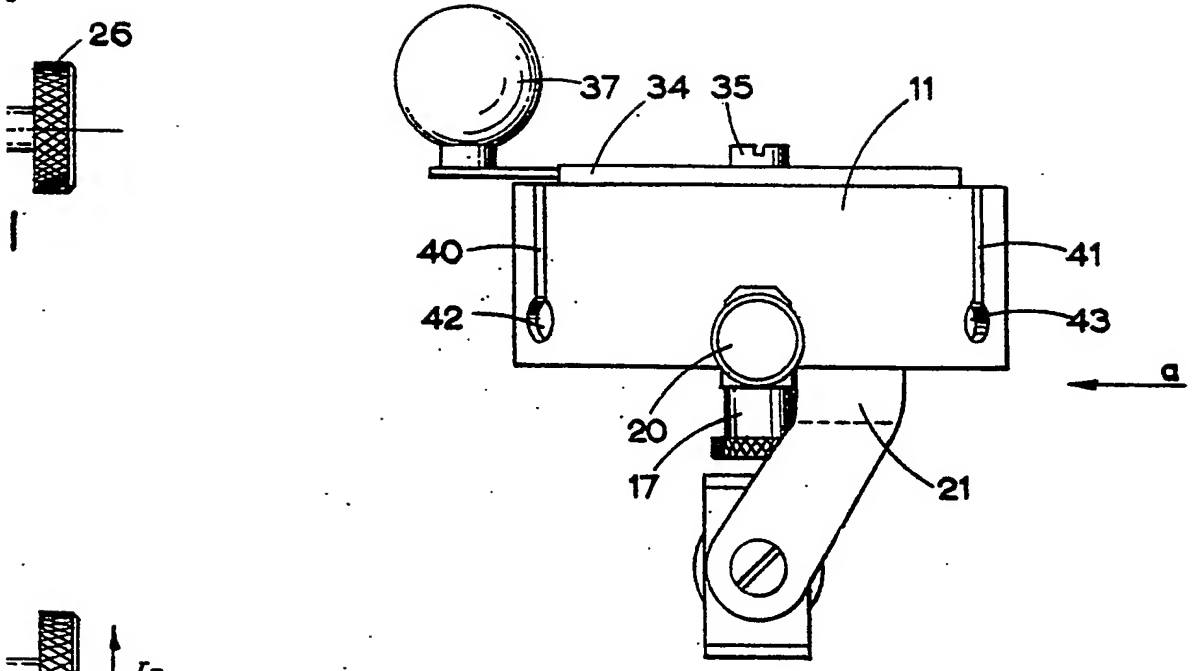

FIG. 3

727,001 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2

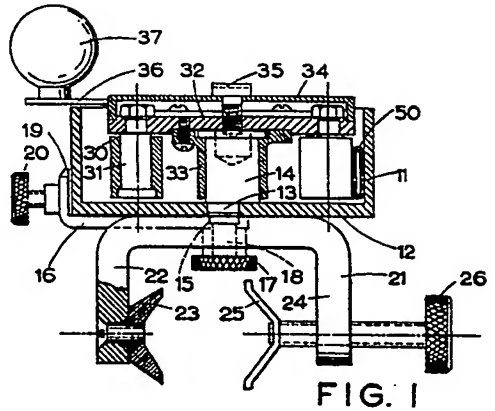

FIG. 1

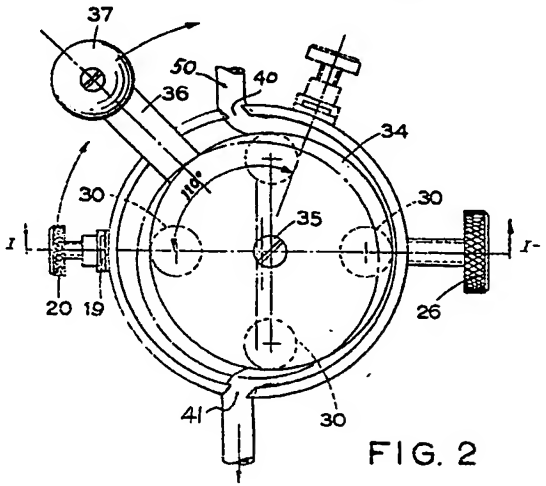

FIG. 2

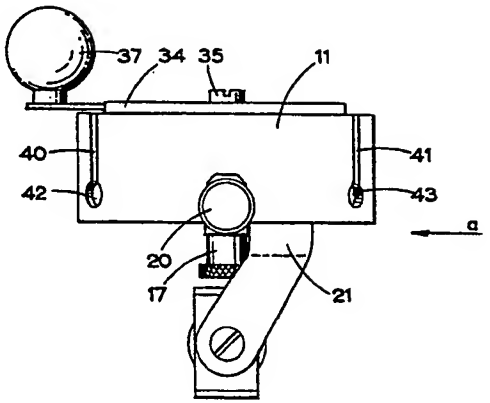

FIG. 3